ECE 622 (ESS) **Due: October 26, 2017**
Fall 2017

HOMEWORK ASSIGNMENT #2

Problem 1. Given the first-order filter

$$H(s)=\frac{K_o\left(1+ {s}/{\omega_Z}\right)}{1+ {s}/{\omega_p}}$$

Obtain the corresponding $H(z)$ using bilinear mapping. Then verify the result for

$$\omega_Z = 2\pi\times 50\ K\ {r}/{s},\ \omega_p = 2\pi\times 10\ K\ {r}/{s},\ K_o = 1,\ f_c = 100KH_z$$

i) Plot H(s) and H(z) in the same figure.

ii) Obtain the block diagram of H(z).

iii) Assuming the feedback capacitor C_F=10pF, propose a SC implementation and simulate the SC implementation for a) ideal op amp and b) with a minimum finite GB value that satisfy

$$aGB\frac{T}{2} > 5$$

Plot the results of a) and b). Make comments of your results.

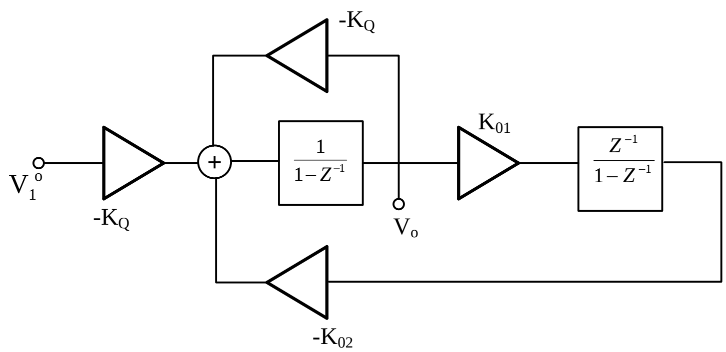
Problem 2. The following transfer function describes a bandpass

$$H^{oo}(Z) = -\frac{K_Q}{1+K_Q}\frac{1-Z^{-1}}{1-2r\cos\Theta Z^{-1}+r^2Z^{-2}}$$

where

$$r^2 = \frac{1}{1+K_Q}$$

$$-2r\cos\Theta = \frac{2+K_Q - K_{o1}K_{o2}}{1+K_Q}$$



Using MATLAB (SIMULINK) or CADENCE macromodel simulate the filter shown above for r = 0.9710303 and $\Theta = 35.957^o$

a) Assume $GBT \to \infty$; $T = 1/f_c$

b) Assume $GBT = \{15{,}600\}$

Compare results and make comments. Notice that we are using a normalized $GB_n = GB/f_c = GBT$. Hint make K01=K02